Stratigraphy and Depositional Setting of the Half-Graben Carbonate Ramp - Aruma Reservoir in Mukhaizna Field, Sultanate of Oman: Key to Assessing Pay Distribution

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Abstract

The Aruma reservoir, discovered in the West graben of the South Mukhaizna field, Oman, contains a significant oil accumulation characterized by high viscosity (averaging 6000 cp) and low API (12). It was found in Upper Cretaceous Campanian aged limestone, Upper Arada Member within the Fiqa Formation of the Aruma Group. This reservoir exists at relatively shallow depths, ranging from 2000 to 2300 feet below surface.

Through the implementation of the Half-Graben geological concept and application of seismic stratigraphy, this reservoir study effectively mapped both the pay and non-pay areas. Seismic data, vertical well logs and core samples allow interpretation of Aruma stratigraphy and depositional environments as being from inner, middle and outer ramp settings within a half-graben restricted basin. The oil has been trapped in the inner-mid ramp facies, which are deposited in both the eastern and western portions of the basin, while the outer ramp areas located in the basin center represent fine-grained non-pay facies that are filled with bound water.

The key to mapping pay distribution was the construction of an appropriate structural, stratigraphic and depositional framework for use in building a reliable geological model.

This geological model both estimates reservoir volumes and comprehensively predicts the areal and stratigraphic distribution of intervals likely to yield higher volumes of oil. Moreover, it provides the crucial 3D reservoir properties essential for fluid-flow simulations.

The result of the study was that a successful horizontal well was drilled in an undeveloped area within the western part of the field. The geologic understanding of this area opens new potential for development and provides the geologic context for a development strategy to maximize oil recovery.